

Case Study No. 6 High-Solids Coatings
Bentwood Furniture
Grants Pass, OR

Background

Bentwood Furniture is an independent furniture manufacturer that sells nationwide and in Canada, with annual sales of about \$9 million. They manufacture dining room, bedroom, and home theater furniture. The facility runs two 8-hour shifts, Monday through Friday, and occasionally operates on Saturdays for shipping and rework. Bentwood has 89 employees, 11 of whom are finishing employees. They switched to high-solids, low-HAP coatings in 1997 to reduce emissions and ensure compliance with the Wood Furniture NESHAP. They plan to switch to waterborne coatings sometime in the future.

Manufacturing and Coating Operations

Bentwood manufactures all their furniture on-site (only the chair cushions are assembled off-site). Raw lumber (oak, cherry, and myrtle wood) is received at the facility and is milled into various furniture components. The wood chips and sawdust from the milling operations are sold to a local firm. The furniture may be assembled before (e.g., a chair) or after (e.g., an entertainment center) it is coated.



Milling operations

Bentwood has one coating line that is approximately 100 feet long and circular in shape. The product is suspended from hooks and travels around the line 3 times -- once each for application of stain, sealer, and topcoat. The pieces are placed on the line at intervals of approximately 1 minute to allow adequate time for the spray operator to coat each piece. On the first pass around the line, the stain is hand wiped onto the piece; Bentwood has 10 to 12 different stain colors that they can apply to different products. The sealer is applied using an HVLP or airless spray gun. The piece is sanded and then the topcoat (usually low-gloss) is applied using an HVLP or airless spray gun. The line speed varies by product, but is typically 8 to 12 feet per minute (one pass around the line takes about 12½ minutes).

There are no drying ovens on the finishing line. To ensure each piece is fully dried before packaging, operators let the finished product sit for about half an hour in an area at the end of the finishing line before stacking or packaging. Products with finishing defects are sanded and recoated (no solvent is used for rework). Products with defects in the wood are disassembled, and the defective component is replaced.

Coatings are received in 55-gallon drums from two coating suppliers. Bentwood uses U.S. Cellulose stains and Lilly sealers and topcoats. Enough coating for about one week of operation is received with each shipment. The empty drums are returned to the coating suppliers for reuse. In the future, Bentwood plans to start using large totes in containment areas.

Cleaning Operations

Bentwood currently uses acetone to clean their spray guns. The solvent is sprayed into the spray booth. Cleaning rags are sent off-site to be laundered and are reused. The facility previously used paper spray booth filters and changed them twice per week. They now use fiberglass-based filters which last twice as long and therefore create less solid waste.

Conversion to High-Solids Coatings

Bentwood switched their coatings in 1997. They reduced both VOC and HAP emissions by going to a high-solids, low-HAP sealer and topcoat. They also reduced the VOC and HAP content of some stains. A conversion to waterborne coatings is planned in the next few years. When Bentwood makes the switch, the plant will be expanded and new spray equipment and drying ovens will be purchased. They plan to convert to a finishing line that uses tow carts under a hanging line and will stay with their current coating suppliers.



Spray line

Facility personnel stated that the conversion to the high-solids, low-HAP sealers and topcoats was smooth. No additional operator training due to the coatings change was necessary. Their coating suppliers had worked with similar facilities to convert their coating systems, so the conversion process at Bentwood was relatively smooth. The coating suppliers brought small amounts of each coating for the facility to test, and the coatings were reformulated only once due to excessive dry time. The change to HVLP guns for all staining and some sealer and topcoat application did require some additional operator training.

The new coatings do contain some acetone. If the temperature in the finishing room gets too high, it sometimes is necessary to add more acetone to the coating to prevent too much solvent from evaporating before the coating reaches the piece. However, since acetone is neither a VOC nor a HAP, this thinning does not contribute to the facility's overall VOC or HAP emissions.

Costs

The switch to low-HAP coatings has reduced their permit cost and the paperwork required by their permit because they have reduced their HAP emissions. They also use less coating per piece because their new coatings have a higher solids content and they use HVLP guns for most of their coating application. This has created a cost savings for the company because the coating cost per gallon remained about the same overall.

Emissions

Bentwood stated that they were emitting over 10 tons each of nine different HAPs with their old system, and now emit about 20 tons of total HAPs, which consist largely of glycol ethers and xylene. Bentwood uses two types of sealer and two types of topcoat. The material safety data sheet (MSDS) showed that these coatings range in solids content from 20 to 32 percent and have HAP contents of 0.16 to 0.38 pound of HAP per pound solids.



Product sample

Customer Feedback

Facility personnel stated that their customers like the products finished with the new coatings. They particularly like the depth of the new stains. There has been no change in the number of complaints received. Bentwood is satisfied with their new finishing system and the reductions in cost and labor it has given them.